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REMARKS

In paragraphs 1, 2 and 3 of the Office Action claims 1, 2-7, 13, 17 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Responsive hereto, Applicant has reviewed these claims, and others, and Applicant has amended these claims to provide proper antecedent basis for limitations such as "said heater" and "said magnetic sensor" throughout the claims. Applicant respectfully submits that the amendments made herein to the claims satisfy this ground of rejection.

In paragraphs 4 and 5 of the Office Action claims 1-2, 4-6 are rejected under 35 U.S.C. 102(e) as being anticipated by Gillis et al (US Pat. No. 6822819 B1), stating:

"As recited in claim 1, Gillis et al show a heating device (including 902 and 1002) for a magnetic recording head, said heating device comprising: an electrical resistor 902 for Joule heating; at least one lead 1002 connected to said electrical resistor; and where said recording head includes a metallic structure (904, for example) that is disposed at (see locations of 904 and ABS in Fig. 9) an air bearing surface (ABS) of said recording head and where said heater 902 is disposed adjacent to (see locations of 902 and 904 in Fig. 9) said metallic structure 904, and where said heater 902 is located adjacent to the ABS of said recording head (see locations of 902 and ABS in Fig. 9).

As recited in claim 2, Gillis et al show that said heater 902 is electrically isolated from (see Fig. 10; see also col. 5, lines 28-31) a sensor 74 and an inductive write pole portion (P 1, for example) of said recording head.

As recited in claim 4, Gillis et al show that said heater has an average operating temperature in a range of about 200°C to about 800 °C (see col. 5, lines 45-47, "25-250° Celsius", which overlaps the claimed range).

As recited in claim 5, Gillis et al show that an electrical resistance of said heater is in a range of about 50 Ohms to about 500 Ohms (see col. 5, lines 43-45, "preferably between about 25 and 250 ohms", which overlaps the claimed range).

As recited in claim 6, Gillis et al show that said heater is comprised of one of NiCr, IrRh and NiFe alloys ("alloy of nickel and chromium", see col. 5, lines 40-41)."

Responsive hereto, Applicant has amended independent claim 1 to include the limitations previously set forth in objected-to claim 7 (previously dependent from claim 1). Specifically, as is set forth in paragraphs 12 and 13 of the Office Action, claim 7 would be allowable if rewritten to overcome the rejections under 35 U.S.C. 112, second paragraph, and to include all limitations of the base claim. As indicated hereabove, Applicant has amended independent claim 1 to cure

the indefiniteness problems of original claim 1, and Applicant therefore submits that amended independent claim 1 which includes the limitations of objected-to claim 7, is now allowable.

With regard to dependent claims 2 and 4 and 5, Applicant urges that the claims include limitations that are not taught by the cited prior art, and alternatively, that these claims are allowable in that they depend either directly or indirectly from an allowable base claim, amended independent claim 1. Claim 6 has been cancelled.

In paragraph 6 of the Office Action claims 8-9 are rejected under 35 U.S.C. 102(e) as being anticipated by Terris et al (US Pat. No. 7068453 B2), stating:

"As recited in claim 8, Terris et al show a magnetic recording head for recording on a magnetic medium, said recording head comprising: an air bearing surface 12 (ABS) having a leading (right) edge and a trailing (left) edge (see arrow 23 for medium moving direction); a write gap (51, for example); a metallic structure 20 being disposed at said ABS; an electrical heating device 70 which generates a heat spot on said magnetic medium which is larger than a magnetic track width of said recording head ("resistive heater is wider than the data track and heats both the data track and adjacent tracks", see abstract), and heats a portion of said magnetic recording head which is on a leading edge side of said write gap 51 of said magnetic recording head, and where said heater 70 is disposed adjacent (see Fig. 2) to said metallic structure 20 and adjacent to said ABS 12.

As recited in claim 9, Terris et al show that said heating device 70 is exposed (see Fig. 2) at an air-bearing surface 12 of said recording head and directly heats said magnetic medium 40."

Responsive hereto, Applicant has amended independent claim 8 to include the further limitation that a metallic structure is disposed between the electrical heating device and the ABS. This magnetic head structure is depicted in Fig. 4 of the Application.

With regard to the teachings of Terris '453 and the other prior art of record, in each instance the heating element in the prior art reference is disposed at the ABS or separated therefrom by some insulation to prevent corrosion or electrical discharge problems. Applicant perceives no structure within the cited prior art in which a metallic structure is disposed between the heating element and the ABS. Applicant submits that this magnetic head configuration of Fig. 4 as reflected in the limitations of amended independent claim 8, is neither taught by nor obvious from the prior art.

Regarding dependent claim 9, it has been cancelled.

In paragraphs 7-9 of the Office Action claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gillis et al (US Pat. No. 6822819 B1), stating

“Gillis et al show a head as described above.

As recited in claim 3, Gillis et al are silent regarding the claimed dimensions. Official notice is taken of the fact that it is notoriously old and well known in the magnetic head art to routinely modify a magnetic head structure in the course of routine optimization/ experimentation and thereby obtain various optimized relationships including those set forth in claim 3.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have had the magnetic head of Gillis et al satisfy the relationships set forth in claim 3. The rationale is as follows: one of ordinary skill in the art would have been motivated to have had the magnetic head of Gillis et al satisfy the relationships set forth in claim 3 since it is notoriously old and well known in the magnetic head art to routinely modify a magnetic head structure in the course of routine optimization /experimentation and thereby obtain various optimized relationships including those set forth in claim 3. Moreover, absent a showing of criticality (i.e., unobvious or unexpected results), the relationships set forth in claim 3 are considered to be within the level of ordinary skill in the art.

Additionally, the law is replete with cases in which when the mere difference between the claimed invention and the prior art is some range, variable or other dimensional limitation within the claims, patentability cannot be found. It furthermore has been held in such a situation, the Applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Moreover, the instant disclosure does not set forth evidence ascribing unexpected results due to the claimed dimensions. See *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitations failed to point out a feature which performed and operated any differently from the prior art.”

Responsive hereto, Applicant has amended dependent claim 3 to delete the dimensional limitations previously set forth therein, and to include new limitations that the metallic structure is a magnetic pole pedestal. Applicant urges that dependent claim 3 includes limitations that are not taught by the prior art, and alternatively, that dependent claim 3 is allowable in that it depends from an allowable base claim, amended independent claim 1.

In paragraph 10 of the Office Action claims 11-15, 17, 19-20, 23 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maat (US Pat. No. 6940691 B2) in view of

Terris et al (US Pat. No. 7068453B2), stating:

"As recited in claim 11, Maat shows a magnetic recording head (see Fig. 3B), comprising:

an inductive write head, where said write head has a write gap WG, an electrical heating device located on a leading edge side (see col. 3, lines 48-51, "Although FIGS. 3A-3B show the heater 20 located in the write gap WG, the heater may also be located outside the write gap, for example above pole P2 or below P1 in FIG. 3A") of said write gap WG, where said heater 20 is disposed adjacent to a metallic structure (P1 or P2, for example) at an air bearing surface (ABS) of the recording head.

As recited in claim 11, Maat is silent regarding a read sensor, wherein said heating device generates a heat spot on the ABS which is larger than a magnetic track width.

As recited in claim 11, Terris et al show a read sensor 60, wherein heating device 70 generates a heat spot on the ABS (see 70 in Fig. 1) which is larger than a magnetic track width (see 21 in Fig. 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add the read sensor. The rationale is as follows: one of ordinary skill in the art would have been motivated to reproduce data as is notoriously well known in the art.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the heating device of Maat to generate a heat spot on the ABS which is larger than a magnetic track width as taught by Terris et al. The rationale is as follows: one of ordinary skill in the art would have been motivated to generate a heat spot on the ABS which is larger than a magnetic track width so as to heat the data track very efficiently while minimizing a heater temperature for a given required media temperature as taught by Terris et al (see col. 2, lines 25-38).

As recited in claim 12, Maat shows that said write head includes a first magnetic pole (P1 or P2) and a second magnetic pole (P2 or P1), and wherein said second magnetic pole is located on a trailing edge side of said first magnetic pole.

As recited in claim 13, Maat shows that at least a portion of said heater 20 is exposed at said ABS (see Fig. 3B).

As recited in claim 14, Maat is silent regarding a perpendicular recording head.

As recited in claim 14, Terris et al show a perpendicular recording head (see col. 1, lines 10-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the head of Maat a perpendicular recording head as taught by Terris et al. The rationale is as follows: one of ordinary skill in the

art would have been motivated to make the head a perpendicular recording head in order to approach ultra-high recording density as taught by Terris et al (see col. 2, lines 54-60).

As recited in claim 15, Maat is silent regarding a longitudinal recording head. As recited in claim 15, Terris et al disclose a longitudinal recording head (see col. 1, lines 30-33).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the head of Maat a longitudinal recording head. The rationale is as follows:

one of ordinary skill in the art would have been motivated to make the head a longitudinal recording head in order to make the head compatible with commercially-available disk drives as taught by Terris et al (see col. 1, lines 30-33).

As recited in claim 17, Maat is silent regarding whether said read sensor is a magnetoresistive element.

As recited in claim 17, Terris et al show a magnetoresistive element ("MR", see col. 1, line 42).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add an MR to the head of Maat as taught by Terris et al. The rationale is as follows:

one of ordinary skill in the art would have been motivated to add an MR in order to provide high read sensitivity during data reproduction as is notoriously well known in the art.

As recited in claim 19, Maat is silent regarding the numerical limitations recited in claim 19.

Official notice is taken of the fact that it is notoriously old and well known in the magnetic head art to routinely modify a magnetic head structure in the course of routine optimization/ experimentation and thereby obtain various optimized relationships including those set forth in claims 19-20.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to have had the magnetic head of Maat satisfy the relationships set forth in claims 19-20. The rationale is as follows: one of ordinary skill in the art would have been motivated to have had the magnetic head of Maat satisfy the relationships set forth in claims 19-20 since it is notoriously old and well known in the magnetic head art to routinely modify a magnetic head structure in the course of routine optimization /experimentation and thereby obtain various optimized relationships including those set forth in claims 19-20. Moreover, absent a showing of criticality (i.e., unobvious or unexpected results), the relationships set forth in claims 19-20 are considered to be within the level of ordinary skill in the art.

Additionally, the law is replete with cases in which when the mere difference between the claimed invention and the prior art is some range, variable or other dimensional limitation within the claims, patentability cannot be found.

It furthermore has been held in such a situation, the Applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Moreover, the instant disclosure does not set forth evidence ascribing unexpected results due to the claimed dimensions. See *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338 (Fed. Cir. 1984), which held that the dimensional limitations failed to point out a feature which performed and operated any differently from the prior art.

As recited in claim 23, in addition to the above teachings, Maat shows a hard disk drive (see ¶ 0003), which inherently comprises a spindle and motor for rotating a magnetic disk; and an arm comprising a suspension and the magnetic recording head, for selectively locating said magnetic recording head over said magnetic disk.

As recited in claim 25, Maat shows a thermally-assisted recording method, comprising:

heating a spot (part of 20) on an air bearing surface (ABS) of a magnetic recording head ("TAMR head", see col. 3, line 35) utilizing an electrically resistive heater 20, where said spot is located on a leading edge side (see col. 3, lines 48-51, "Although FIGS. 3A-3B show the heater 20 located in the write gap WG, the heater may also be located outside the write gap, for example above pole P2 or below P1 in FIG. 3A") of a write gap (WG) of said magnetic recording head.

As recited in claim 25, Maat is silent regarding generating a heat spot on a recording medium which is larger than a magnetic track width.

As recited in claim 25, Terris et al show generating a heat spot on a recording medium which is larger than a magnetic track width.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to generate a heat spot on a recording medium of Maat which is larger than a magnetic track width as taught by Terris et al. The rationale is as follows: one of ordinary skill in the art would have been motivated to easily implement the heater in a head structure and to heat the data track very efficiently by minimizing the required heater temperature for a given required media temperature as taught by Terris et al (see col. 2, lines 25-38).

As recited in claim 26, Maat shows that said heating comprises using said electrically resistive heater 20 to (inherently) heat at least one magnetic pole layer (P1 or P2) in said magnetic recording head, and a portion of an air-bearing surface (ABS) of said magnetic recording head."

Responsive hereto, Applicant has amended independent claims 11 and 23 and cancelled independent claim 25 and dependent claim 26. Regarding amended independent claims 11 and 23, Applicant has amended these claims to include the further limitation that the metallic structure is disposed between the electrical resistor and the ABS, as is depicted in Fig. 4 of the

Application. As argued hereabove with regard to amended independent claims and 1 and 8, Applicant urges that this limitation is neither taught by nor obvious from the cited prior art.

Specifically, a review of the prior art reveals that in each instance the heating element in the prior art reference is disposed at the ABS or separated therefrom by some insulation to prevent corrosion or electrical discharge problems. Applicant perceives no structure within the cited prior art in which a metallic structure is disposed between the heating element and the ABS. Applicant therefore respectfully urges that amended independent claims 11 and 23 recite limitations that are not taught by nor obvious from the recited prior art.

With regard to dependent claims 12-15, 17, 19-20, Applicant urges that the claims include limitations that are not obvious from the cited prior art, and alternatively that the claims are allowable in that they depend either directly or indirectly from an allowable base claim.

Regarding dependent claim 26, it has been cancelled along with independent claim 25 from which it depended.

In paragraph 11 of the Office Action claims 18, 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maat (US Pat. No. 6940691 B2) in view of Terris et al (US Pat. No. 7068453 B2), and further in view of Gider et al (US PAP No. 20040027719 A1), stating

"Maat shows a head as described above, including heater 20 within the write head.

As recited in claim 18, Maat is silent regarding at least one thermally disruptive layer between said heating device and said magnetic sensor which disrupts thermal conduction from said heating device to said magnetic sensor.

As recited in claim 18, Gider et al show at least one thermally disruptive layer 428 between a write head 418 and a magnetic sensor 412 which disrupts thermal conduction from said heating device to said magnetic sensor.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the head of Maat with at least one thermally disruptive layer between the write head and a magnetic sensor. The rationale is as follows: one of ordinary skill in the art would have been motivated to limit temperature excursions experienced by the read sensor, and to control pole tip protrusion as taught by Gider et al (see ¶ 0009).

As recited in claim 21, Maat is silent regarding whether said at least one thermally disruptive layer comprises a heat sink.

As recited in claim 21, Gider et al show heat sink 428.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a heat sink as the thermally disruptive layer. The rationale is as follows: one of ordinary skill in the art would have been motivated to conduct heat away from the write head as is notoriously well

known in the art.

As recited in claim 22, Maat is silent regarding whether said at least one thermally disruptive layer is comprised of plated copper.

As recited in claim 22, Gider et al show copper (see ¶ 0028).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use copper as the thermally disruptive layer as taught by Gider et al in the head of Maat. The rationale is as follows: one of ordinary skill in the art would have been motivated to provide high heat conductivity and to easily construct the layer by known methods as taught by Gider et al (see ¶ 0028).

The product by process limitations in these claims (e.g., "plated") are directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See also *In re Brown*, 173 USPQ 685; *In re Luck*, 177 USPQ 523; *In re Fessman*, 180 USPQ 324; *In re Avery*, 186 USPQ 161; *In re Wertheim*, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); *In re Marosi et al*, 218 USPQ 289; and particularly *In re Thorpe*, 227 USPQ 964, all of which make it clear that it is the patentability of the final structure of the product "gleaned" from the process limitations or steps, which must be determined in a "product by process" claim, and not the patentability of the process limitations. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not. Note that the applicant has the burden of proof in such cases, as the above case law makes clear."

Responsive hereto, Applicant urges that dependent claims 18, 21 and 22 are allowable in that they contain limitations that are not obvious from the cited prior art, and alternatively that they are allowable in that they depend either directly or indirectly from an allowable base claim, amended independent claim 11.

In paragraphs 12 and 13 of the Office Action it is indicated that claim 7 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims, and that claims 10 and 16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Responsive hereto, Applicant appreciates the indication of allowable subject matter in dependent claims 7, 10 and 16. Responsive hereto, as indicated above, Applicant has inserted the limitations of dependent claim 7 into independent claim 1, and claim 7 has been cancelled.

Regarding dependent claim 10, while it has been objected-to in paragraphs 12 and 13 of

the Office Action, Applicant has further amended dependent claim 10 to clarify that the metallic structure includes a magnetic pole pedestal which functions as a heat spreader. Applicant urges that dependent claim 10 includes limitations that are not taught by the prior art, and alternatively that dependent claim 10 is allowable in that it depends from an allowable base claim, amended independent claim 8.

Regarding dependent claim 16, Applicant urges that this claim is now allowable in that it depends from an allowable independent base claim 11.

In paragraph 14 of the Office Action the prior art made of record and not relied upon is considered pertinent to applicant's disclosure, stating:

"Gillis et al (US Pat. No. 6954327 B2) show a magnetic head comprising a separate heating element 902 as a heat source, wherein "Thin dielectric insulator materials (visible in FIG. 10 only) isolate heating element 902 from first pole piece 92 and first P1 pedestal 904. Preferably, heating element 902 is an electrically resistive heater ... made of a NICHROMETM material which is basically an alloy of nickel and chromium" (see col. 5, line 20-col. 6, line 11).

Hsu et al (US PAP No. 20050068671 A1) show a magnetic transducer comprising copper heat sink 52 between read sensor 35 and write head (comprising pole piece 41; see Fig. 7), wherein "Although the heat sink can extend to the ABS, preferably it does not extend to the ABS to avoid potential smearing problems" (see ¶ 0030; see also ¶ 0014). Ju et al (US Pat. No. 6909674 B2) show a thermally assisted magnetic write head system comprising heating element 41.2 "positioned anywhere in the head, i.e. above and/or below a pole piece, at an air bearing surface" (see col. 4, lines 15-21), and further comprising thermal barriers (see col. 5, lines 3-13; see also col. 4, lines 49-59; see also Fig. 4B).

Fontana, Jr. et al (US Pat. No. 6999277 B2) show a magnetic head comprising heating element 116 "approximately as wide as the track width of the pole tip because it is generally undesirable to heat portions of the magnetic media disposed on data tracks that are adjacent to the track that is being written upon. It is also desirable, though not necessary, that the heating element 116 be fabricated slightly away from the air bearing surface (ABS) 92 of the head, to limit corrosion of the heating element 116 and to avoid possible electrical discharge from the heating device 112 to the media disk during a writing operation" (see col. 4, lines 50-61)."

Responsive hereto, Applicant has reviewed the pertinent prior art, and believes that the claims, as amended, include limitations that are neither taught by nor obvious from this prior art.

Lastly, Applicant notes that new dependent claims 27-29 have been added herein. Applicant submits that these claims are allowable in that they recited limitations that are not taught by nor obvious from the cited prior art, and alternatively that these claims are allowable in that they depend directly or indirectly from an allowable independent base claim.

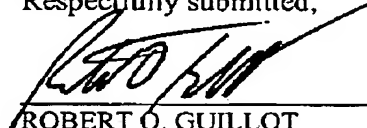
Having responded to all of the paragraphs of the Office Action, and having amended the claims accordingly, Applicant respectfully submits that the Application is now in condition for allowance. Applicant therefore respectfully requests that a Notice of Allowance be forthcoming at the Examiner's earliest opportunity. Should the Examiner have any questions or comments with regard to this amendment, a telephonic conference at the number set forth below is respectfully requested.

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Respectfully submitted,


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